

SPX Communication Technology division, SPX Corporation

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of)	
)	
Service Rules for the 698-746, 747-762 and)	WT Docket No. 06-150
777-792 MHz Bands)	
)	
Implementing a Nationwide, Broadband,)	
Interoperable Public Safety Network in the)	PS Docket No. 06-229
700 MHz Band)	
)	
Amendment of Part 90 of the Commission's)	WP Docket No. 07-100
Rules)	

Comments of the
SPX Communication Technology division
SPX Corporation

The following comments are submitted by the SPX Communication Technology (f/k/a Dielectric Communications) division of SPX Corporation (SPX). SPX is pleased to offer to the Federal Communications Commission ("Commission") its insight on this very important national goal.

SPX or its predecessors have been furnishing RF products to the broadcasting industry for over 60 years. SPX has supplied the majority of TV broadcast transmitting antennas for the U.S. DTV transition. SPX is also on the leading edge of high power RF Filter design technologies involving the ATSC standard and adjacent TV channel combining, for which it received a Technology and Engineering Emmy Award in 2007. SPX has now applied that broadcast expertise toward the development of an innovative telecommunications technology geared to rural markets. SPX, with its long history in the communications field, appreciates the task that the Commission

has outlined and the necessity to revisit various aspects of its policy and rules. These comments are directed to a recent technological development which offers the potential for a faster and more economical implementation of public safety wireless broadband networks in rural America.

Overview of Key Issues

- 1) A nationwide public safety broadband network must include rural coverage.
- 2) Deploying networks for rural coverage presents major cost challenges.
- 3) A network that significantly reduces the number of base station sites while maintaining required reliability and quality of service can drive down costs while reducing deployment time.
- 4) Deployment of fewer base station sites requires expanded coverage from each site.
- 5) Expanded coverage requires positioning transmitting antenna systems at higher elevations and operating at increased effective radiated powers.
- 6) The technology for these antenna systems exists today. However, some changes to the Commission's rules are necessary to apply that technology to the nationwide public safety broadband network.

Coverage Objectives

Paragraph 71 of the Third Report and Order and Fourth Further Notice of Proposed Rulemaking (FNPRM),¹ notes that "Coverage is an important consideration in ensuring that the

¹*Fourth Further Notice of Proposed Rulemaking*, FCC 11-6, adopted January 25, 2011, and released January 26, 2011.

public safety broadband network is interoperable on a nationwide basis. Accordingly, we tentatively conclude that we should impose coverage and performance requirements on the networks that will comprise a nationwide public safety broadband network.” Paragraph 72 of the FNPRM continues with “One approach we can take is to require that the public safety broadband networks cover a certain population or geographic benchmark. Such requirements could impose costs on public safety but could ensure that an increased percentage of the nation benefits from the public safety broadband network and hence, is interoperable.”

Practical Challenges

In discussions with present public safety network users and equipment providers, SPX has been made aware that two of the key factors affecting the implementation of public safety broadband networks are the capital costs (CAPEX) of the base station equipment (transceiver systems, antennas, towers, shelters, etc.) and the ongoing maintenance costs (OPEX) for the base station sites. While SPX agrees that minimum coverage and performance requirements may be necessary to ensure an interoperable nationwide network, it is probable that the deployment of an effective 700 MHz public safety broadband network will require constructing and equipping many additional base station sites just to replicate the coverage of existing narrowband networks. Initially, coverage replication will be important to avoid a disparity of services within presently existing coverage areas. The time and expense required to obtain and deploy these additional sites would directly impact the costs, administrative complexity and speed of network implementation. A network design requiring large numbers of sites also requires significant ongoing OPEX, driving up the total cost of operation (TCO), in addition to negatively affecting the environmental

impact and energy usage of the network.

New Technology to Expand Coverage

The antenna system innovation that SPX has developed, combining the advantages of broadcast technology with those of telecommunications technology, has the potential to significantly reduce both the costs and completion time to deploy a nationwide public safety broadband network, compared to a deployment using typical base station equipment operating under present Commission rules.

As mentioned previously, fewer base station sites also allows for reduced environmental impact and reduction of energy usage.

The antenna system technology being described, geared specifically to rural application, offers the ability to provide, from a single site, the coverage of approximately 10 sites using existing technology (as shown in Exhibit A attached). This reduction in the number of sites enables simplification and speed of site deployment as well as significant reductions in both CAPEX and OPEX. It further offers the flexibility for other entities (public and private) that operate in other frequency bands to operate on the same site, further reducing CAPEX and OPEX through cost sharing efficiencies.

This technology is currently deployed and in operation for wireless telecommunication services in cooperation with an Indian telecom operator, and further global expansion is being negotiated. This project was referenced by the White House in its FACT SHEET² for the U.S.-India Transactions and President Obama's remarks to the U.S.-India Business Council on November 8,

²<http://www.whitehouse.gov/the-press-office/2010/11/06/fact-sheet-national-export-initiative-us-india-transactions>

2010³. However, use of the technology in the U.S. is currently prohibited (absent FCC waivers) because the expanded coverage requires operation at higher ERP levels than are currently allowed. Because the existing FCC ERP limits are based on assumptions about existing technology, they do not anticipate technological advances that provide equal or higher degrees of both RF exposure safety and interference protection at higher ERP levels (as are provided with the SPX antenna system).

Coverage Implications

Relying on existing technology and regulations, meeting coverage and performance objectives in rural areas of America creates a difficult challenge. These areas tend to be unserved or underserved by wireless applications due to the cost of building and maintaining base stations and the difficulty in obtaining satisfactory commercial returns on investments (ROI). Paragraph 75 of the FNPRM addresses this issue by asking “Are there methods to increase the probability of coverage with less or more spectrum, without adding eNodeB sites, repeaters, distributed antennas systems (DAS) or In-Building systems?” These comments are intended to respond specifically and positively to that question.

Through the use of antenna technology such as that described by SPX in these comments and Exhibit A, it is more economically feasible to include rural areas of America in the nationwide public safety broadband network. In many cases, this will be the first access to wide area wireless technologies for those areas. Additionally, in areas presently served by narrow band networks and other wireless networks, the need for additional base station sites (eNodeB sites) can be minimized. This result is a more economical build out as well as a more efficient utilization of resources for the

³<http://www.whitehouse.gov/the-press-office/2010/11/08/remarks-president-us-india-business-council-and-entrepreneurship-summit>

public safety network operator.

A secondary application for this technology could be in non-rural areas where service demand is not so great as to cause detriment to the quality of service (QOS) resulting in additional savings to a nationwide network. Another application of the technology is to provide “umbrella coverage” where occasional terrain blockage may require the use of fill-in sites.

Conclusion

In keeping with the Commission’s statement published in the Federal Register⁴, page 10298, Section E, Paragraph 2, last sentence, “The proposed rules seek to balance the need for flexibility in network design, cost, and implementation with the demands of nationwide interoperability.”, SPX urges the Commission to consider additional changes in the Commission Rules that would enable rural Americans to benefit from the opportunity offered by this new transmission technology to economically provide the services of the nationwide public safety broadband network. Specifically, SPX recommends changes in the allowable power levels for the following spectrum groups: Public Safety Broadband (763-768 MHz and 793-798 MHz) [§90.542(a)(4)] and Upper 700 MHz Band Block D (758-763 MHz and 788-793 MHz) [§27.50(b)(5)].

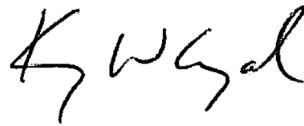
While the network planning process incorporating this antenna technology is still in development, more flexibility in the choice of ERP levels will provide more opportunities for designing reliable, cost effective, wide area coverage rural networks. For additional coverage, higher ERPs are needed. Based on preliminary studies, SPX recommends ERP levels up to 10 kW/MHz. This increased ERP is a function of increased antenna system gain rather than increased transmitter output power. The increase in antenna system gain through advanced beam forming techniques also

⁴ **Federal Register**/Vol. 76, No. 37/Thursday, February 24, 2011/Proposed Rules

provides reduced ground level radiation levels and improved control over interference to cells of other networks. SPX has discussed this technique and its versatility over the past several months with several Commission technical staff members in different bureaus and offices.

We thank the Commission for this opportunity to comment and its consideration of this new technology for use in the nationwide public safety broadband network. We stand ready to answer any questions and to provide additional information that would be of assistance to the Commission in its deliberations.

Respectfully Submitted,



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EXHIBIT A

Rural Wireless Connectivity: Design Concepts for
Ubiquitous Coverage in Low Density Population Areas
From a Presentation at the IEEE Region 1 Northeast Industry Day 2010



Rural Wireless Connectivity: Design Concepts for Ubiquitous Coverage in Low Density Population Areas

From a Presentation at the IEEE Region 1 Northeast Industry Day 2010

Kerry W. Cozad, Dielectric Communications/SPX Corporation

- **Technical Challenges**

- Limited coverage radius of a traditional cell-site leads to large number of cell sites
- Thin population density, in true rural Greenfields, leads to severe underutilization of BTS resources
- Limited resources of power supply to cover the large number of cell sites



Rural Coverage Challenges



• Economic Challenges

- Large CAPEX and OPEX commitment to cover a small population over a large area
- Low income levels
- ROI levels do not equate with the current business models

Cellular Broadcast System Concept

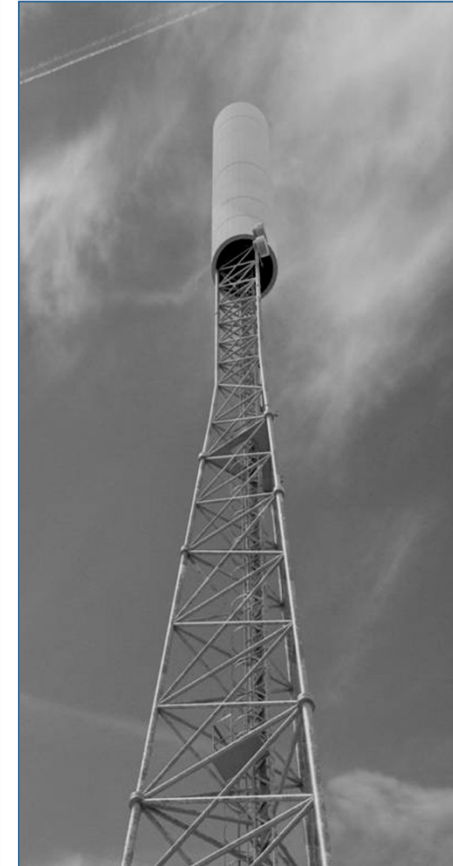


Traditional Antenna



- Coverage Efficient – 6X to 13X greater coverage; uniform power distribution over a wide coverage area.
- Power Efficient – low loss tower-top electronics; antenna radiates most of the power delivered to it
- Cost Efficient –
 - 50% lower capex
 - 50-80% lower opex
- Scalable Capacity

vasTerra™ system



Cellular Broadcast System Concept



Force Coefficient Factor 43% Less

vasTerra™ Wireless System

Broadcast Technology
Improved System Design
10x Coverage = Economical Deployment

Public Safety Interoperability (700 MHz)

Rural Mobile Telephony

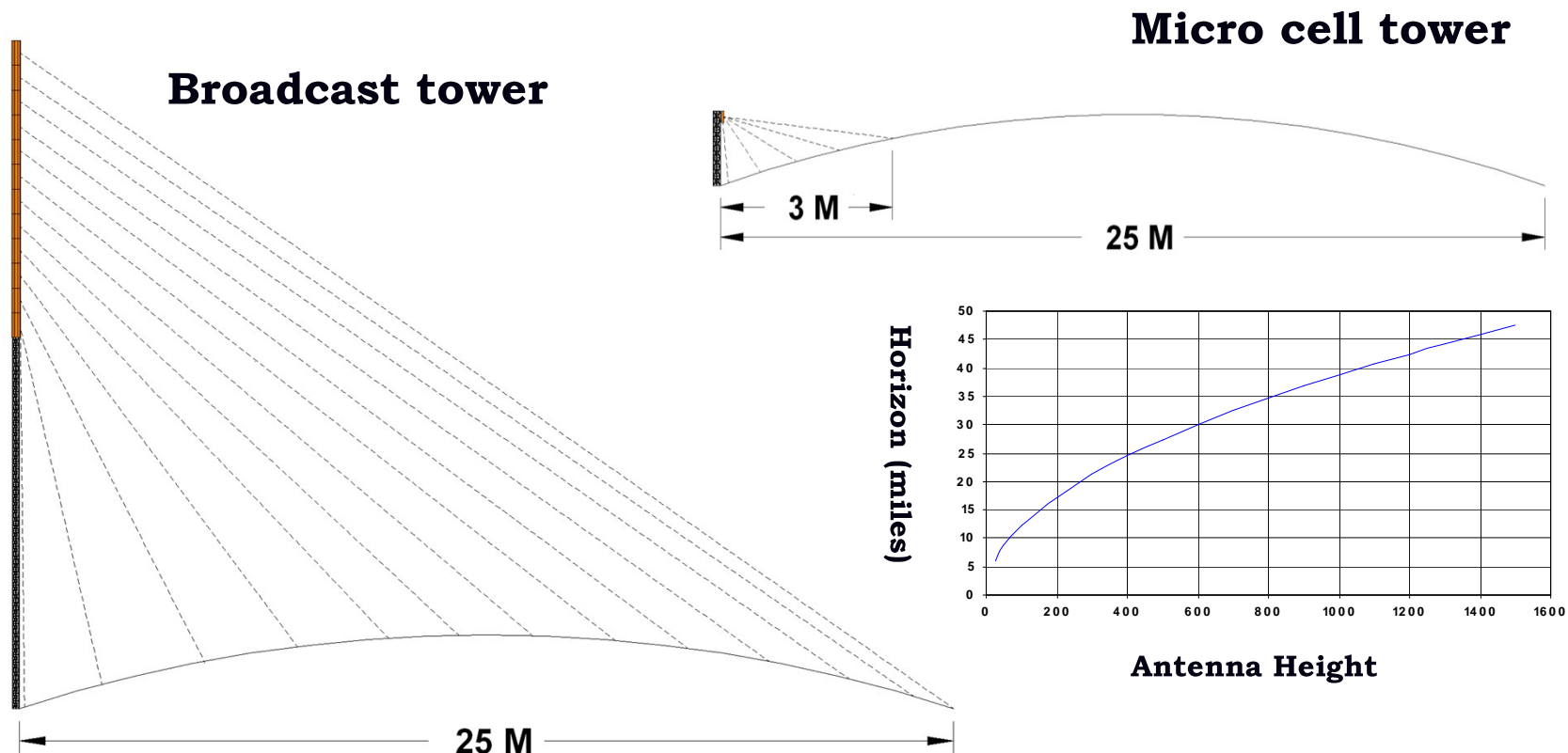
Smart Grid Monitoring

Rural Wireless Broadband Access

How can the coverage be increased 10-20 times?



Raise the antenna. Similar to terrestrial broadcast, high-mounted antennas provide line of sight coverage to a large territory

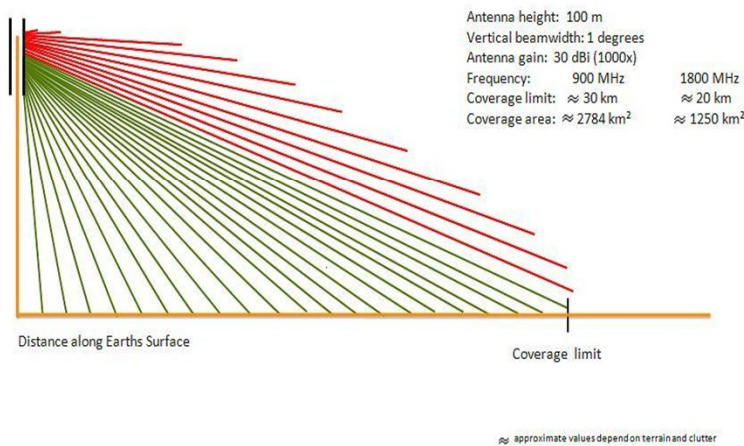


Coverage Benefits of New Antenna System



vasTerra™ Antenna System Site

Figure 2: Coverage of vasTerra cell

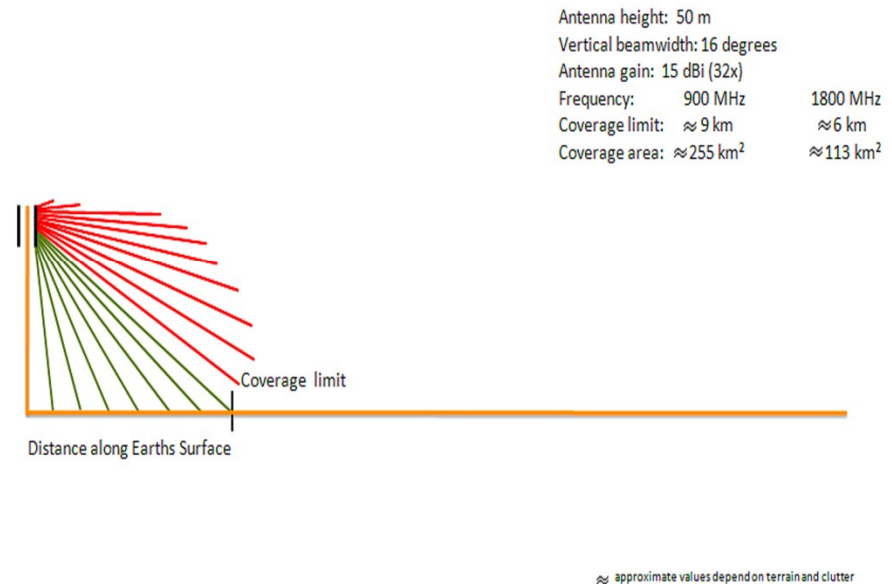


Dielectric vasTerra Cell-site

Coverage is created by a phased-array antenna with a gain 30dB, vertical beam width ~1 deg, and height 100 m

Standard Traditional cell Site

Figure 1: Coverage of standard cell



Standard Cell-site

Coverage is created by an antenna with a gain 16-18dB, vertical beam width 6-8 deg, and height 50 m

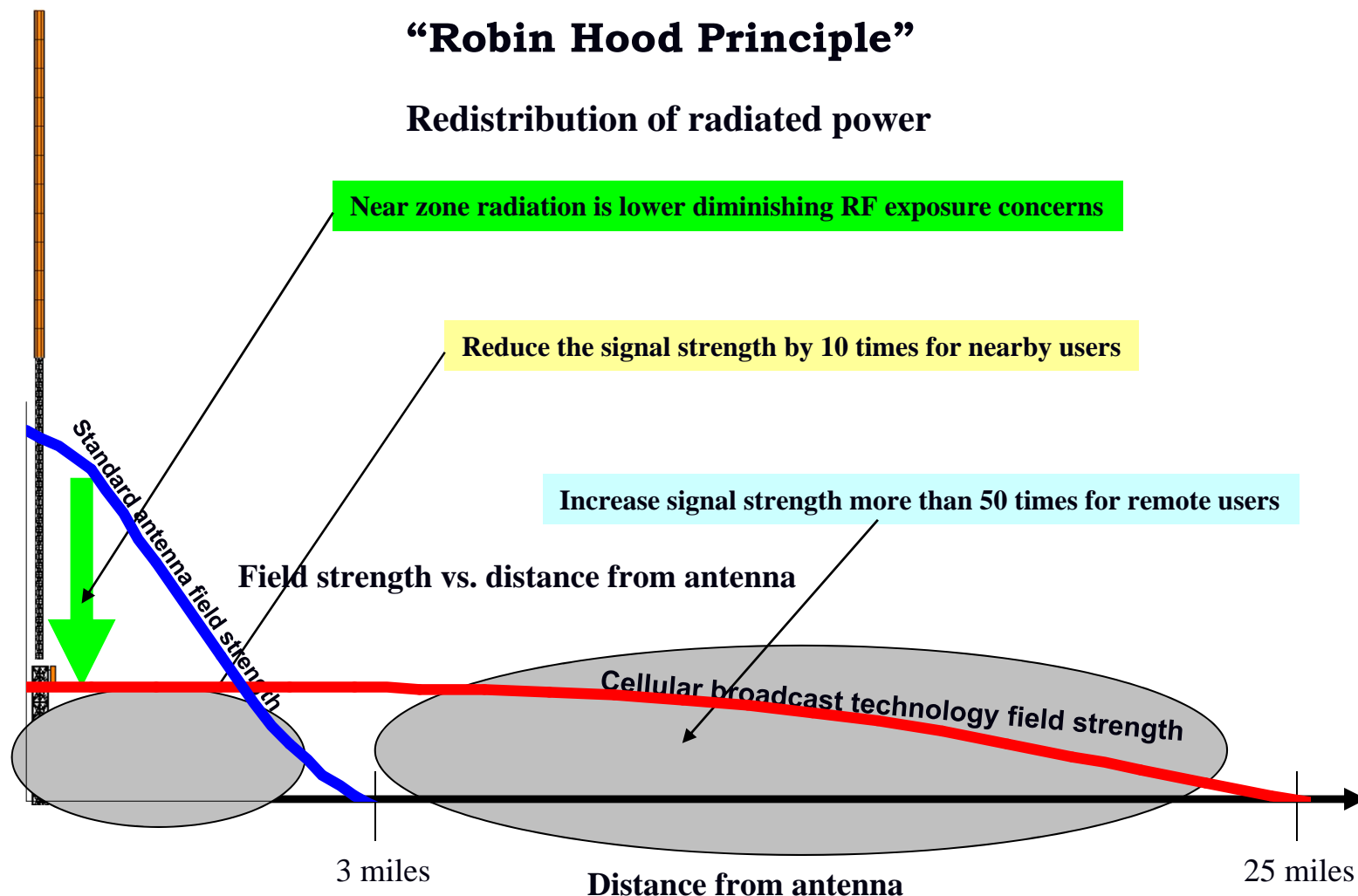
➤ The vasTerra system can achieve 10X coverage, at an average, as compared to the traditional system

“Robin Hood Principle”

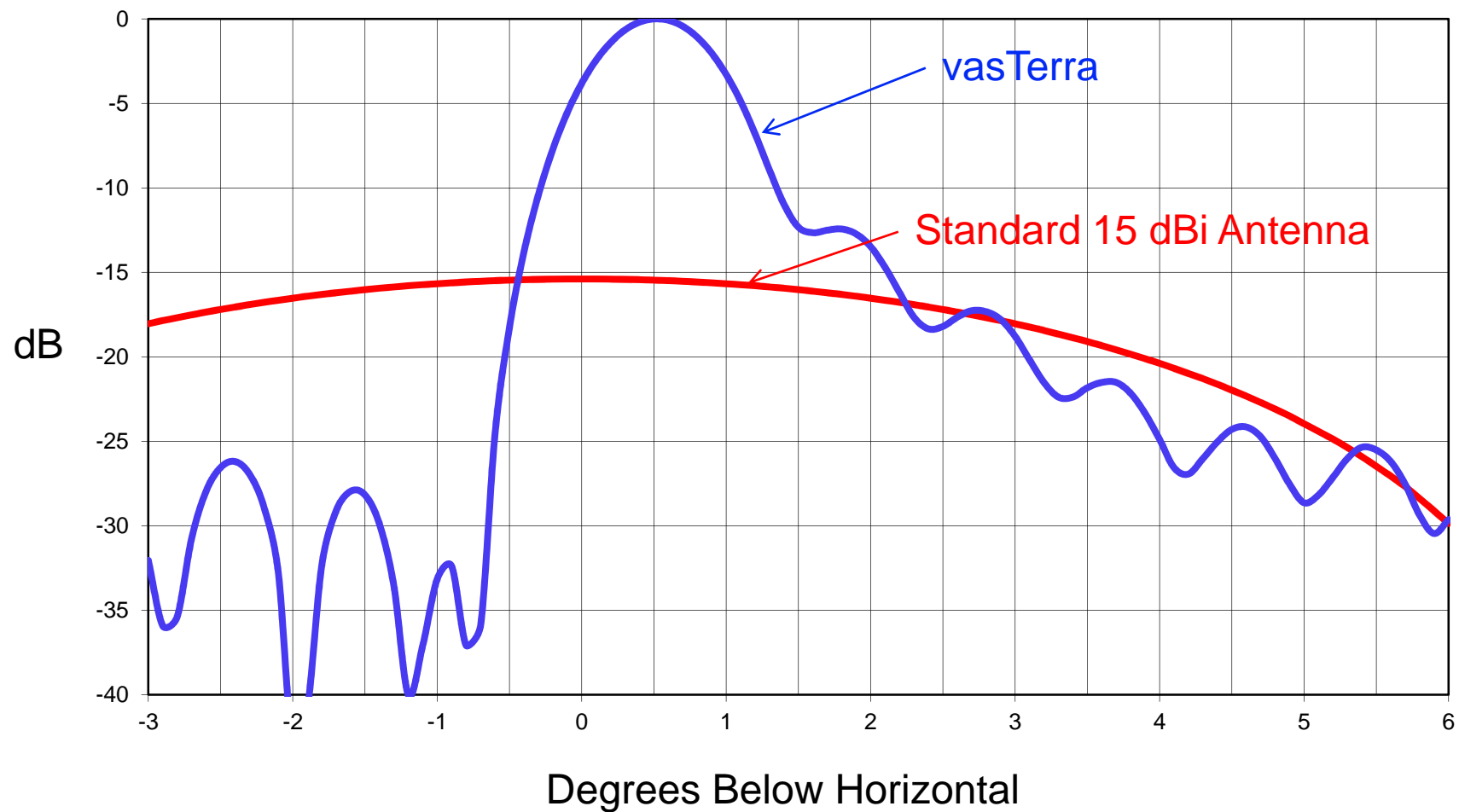
Redistribution of radiated power

Cellular
broadcast
technology

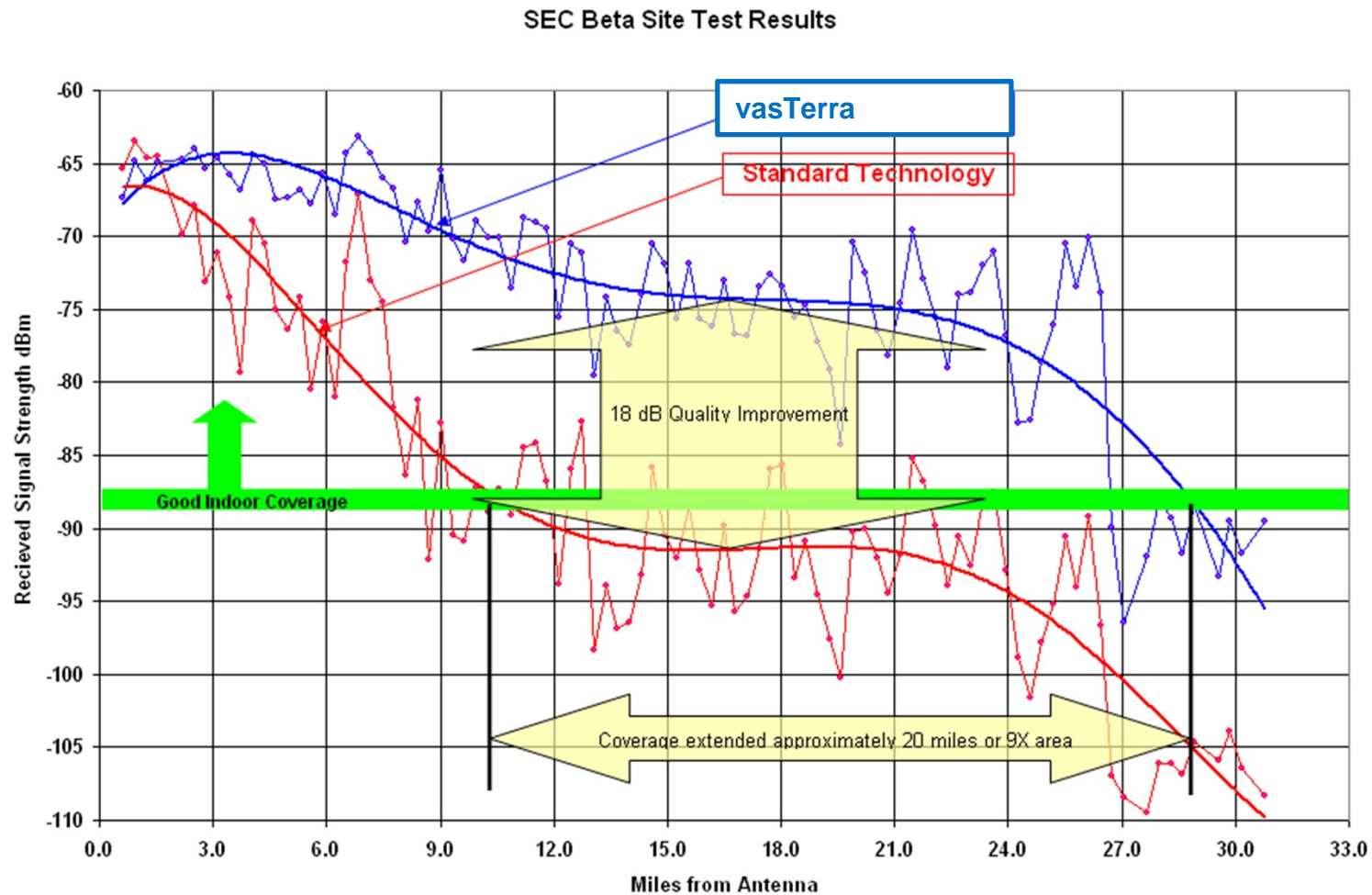
Standard
antenna



Elevation Pattern – Standard 15 dBi Antenna vs. vasTerra™ SPX



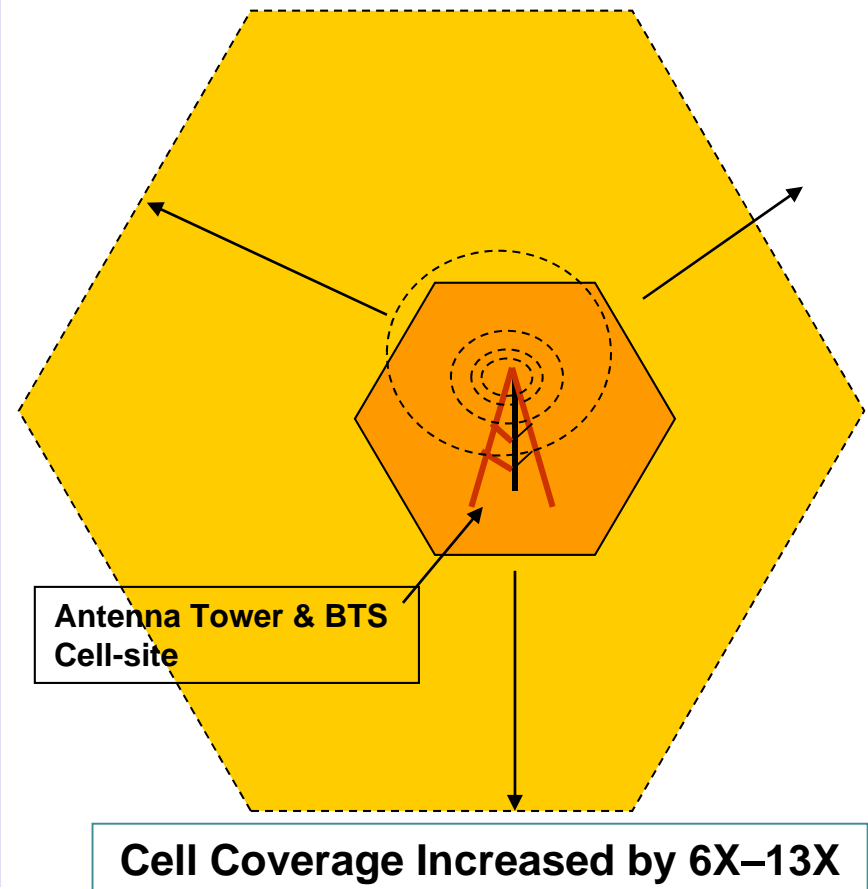
vasTerra™ Beta Site Test Results



Measurements made under FCC Experimental STA
File Numbers 0051-EX-ML-2007 and 0024-EX-ST-2009

Coverage Benefit of vasTerra™ System SPX

- The high mounted antenna provides a line-of-sight radio coverage over a 30-40km range
- High antenna gain, low cable losses, and low NF LNA amplify downlink and uplink signals.
- Link budget improved by 18 to 30dB in comparison to traditional cell-site and coverage by a factor of 6X-13X
- Intelligent beam forming techniques shape and focus the radiated energy so that it is uniformly distributed over the coverage region



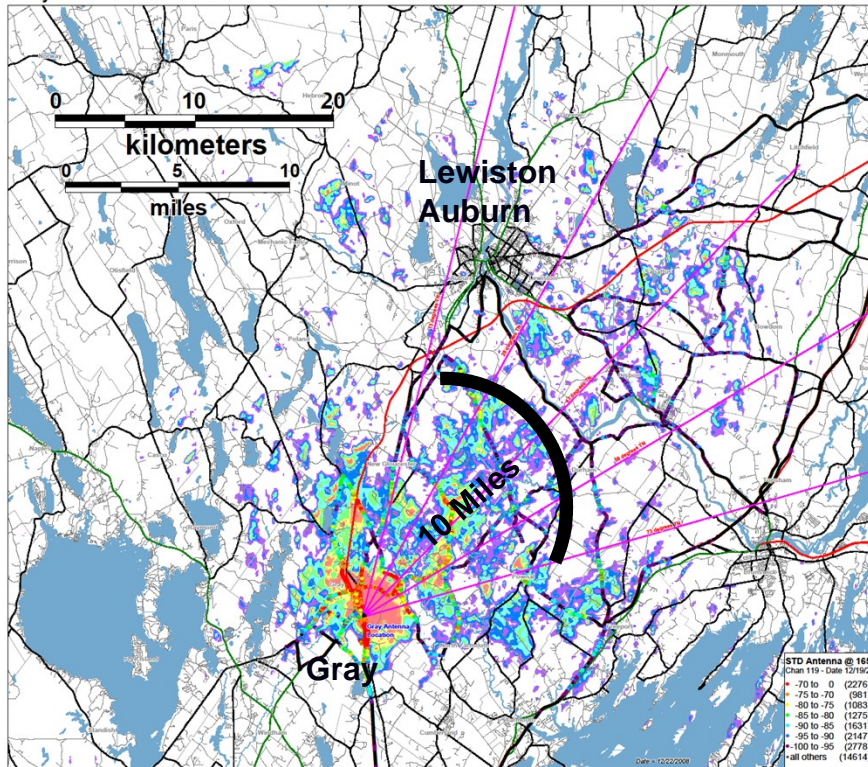
Beta Site – Gray Maine Drive Test Results



Single Sector Results (900 MHz)

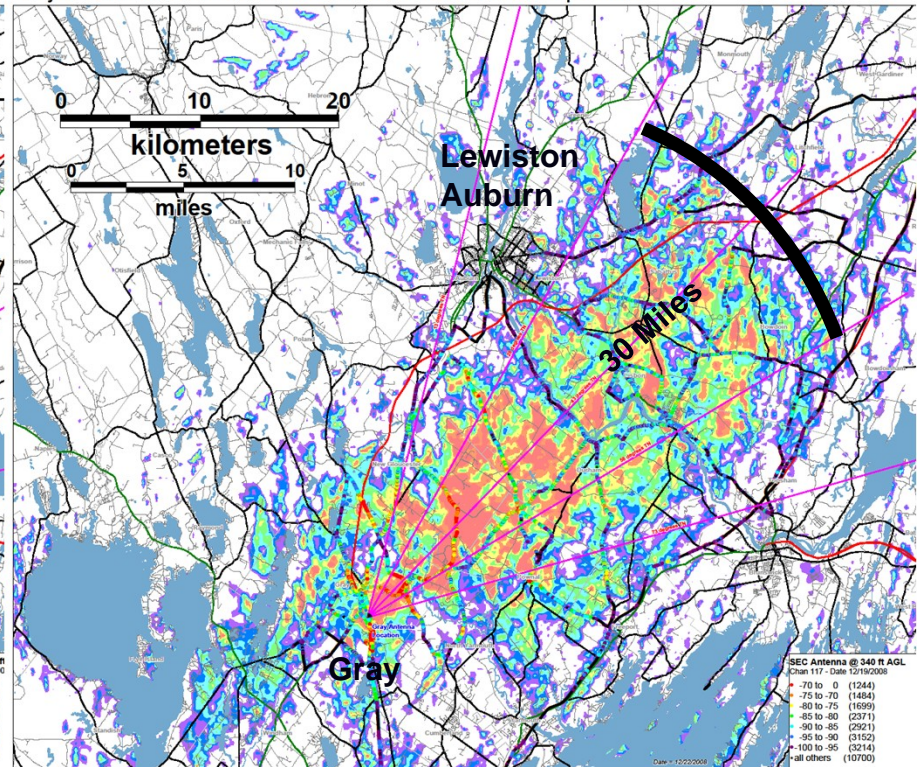
Standard Antenna at 165 ft AGL

Gray ME - Drive test results from Standard Antenna at 165 feet AGL



SEC Antenna at 345 ft AGL

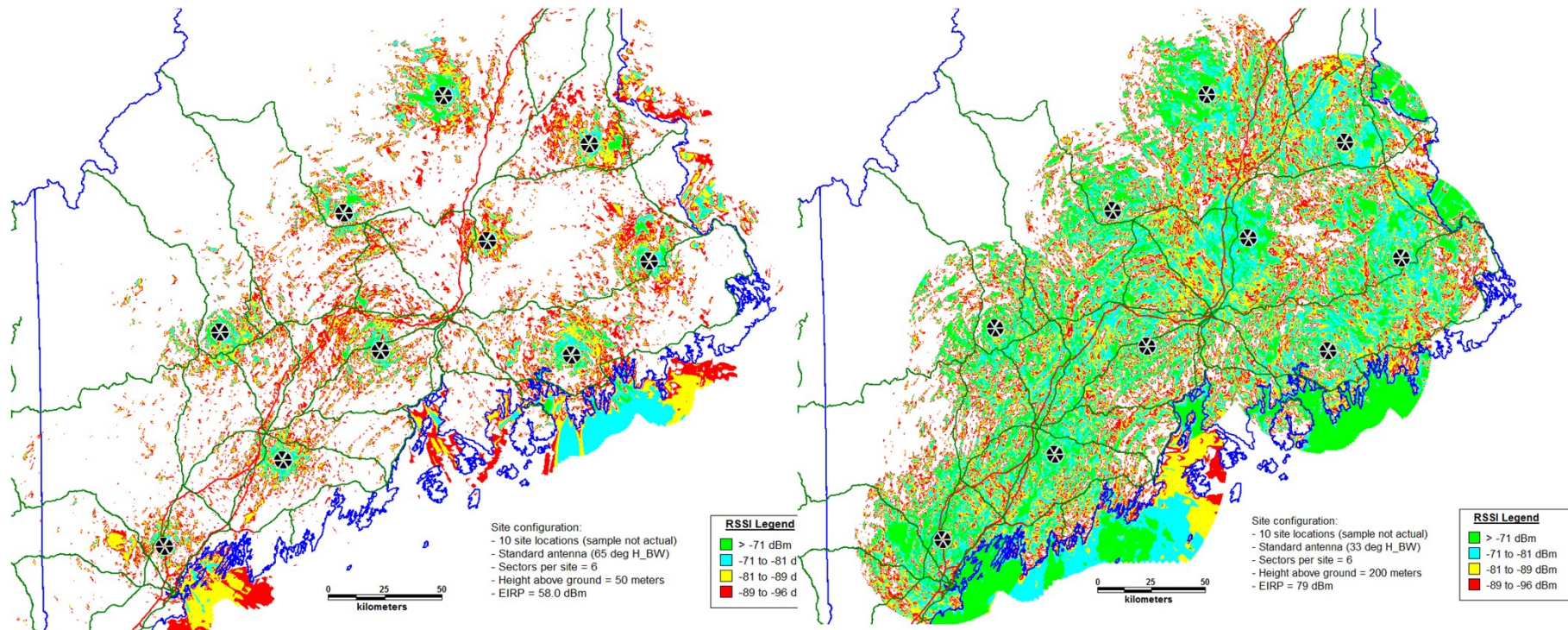
Gray ME - Drive test results from SEC Antenna at 340 feet AGL with initial prediction



SEC Provides 3 Times the Distance in Coverage of a Standard Antenna System

Measurements made under FCC Experimental STA
File Numbers 0051-EX-ML-2007 and 0024-EX-ST-2009

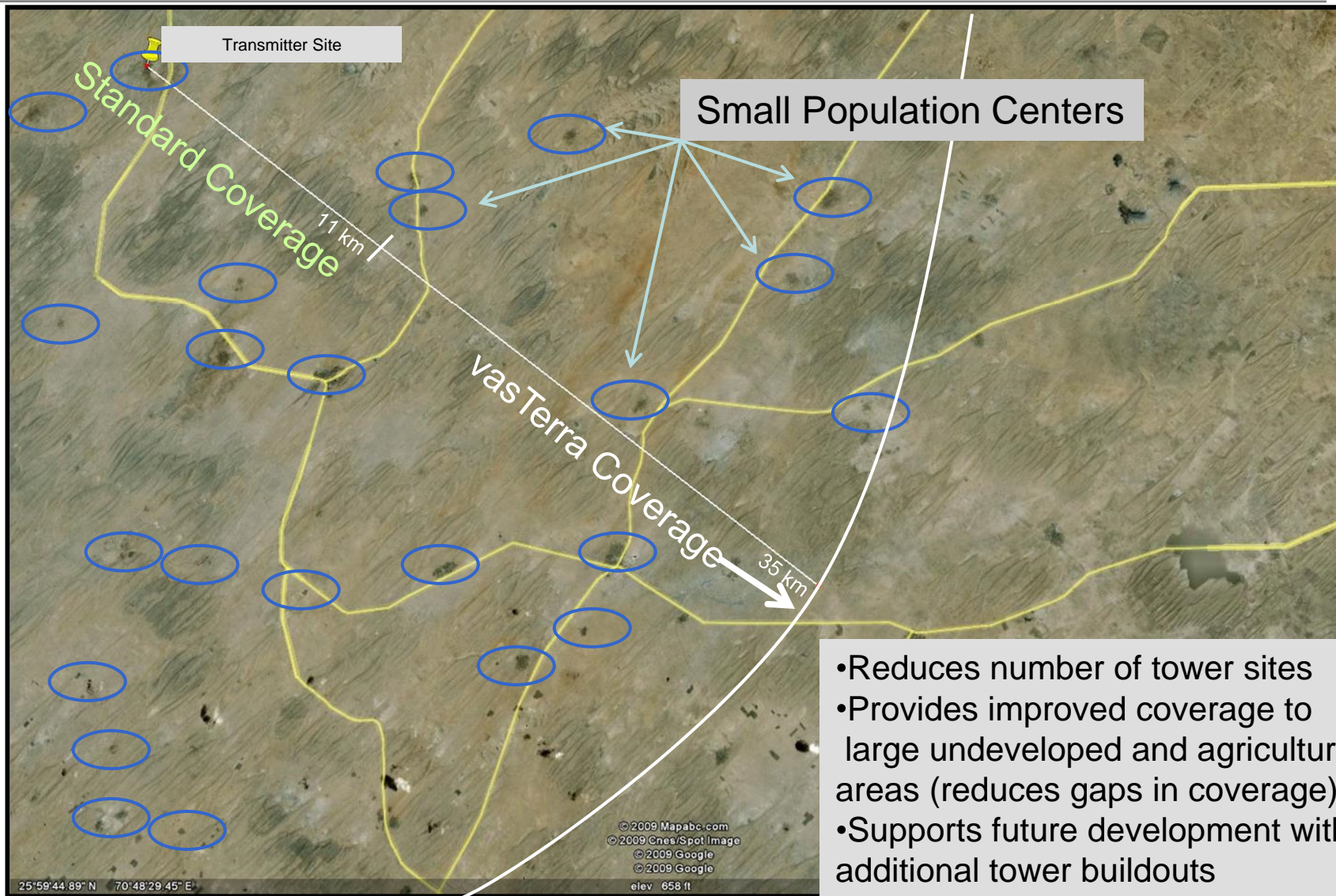
Cell Coverage Enhancement



10 Sites - Standard Macrocell Network

10 Sites - vasTerra™ Network

Benefit for Rural Coverage



- Reduces number of tower sites
- Provides improved coverage to large undeveloped and agricultural areas (reduces gaps in coverage)
- Supports future development without additional tower buildouts

Coverage of Many Villages in Rural Area

Village

Rural U.S. Opportunities

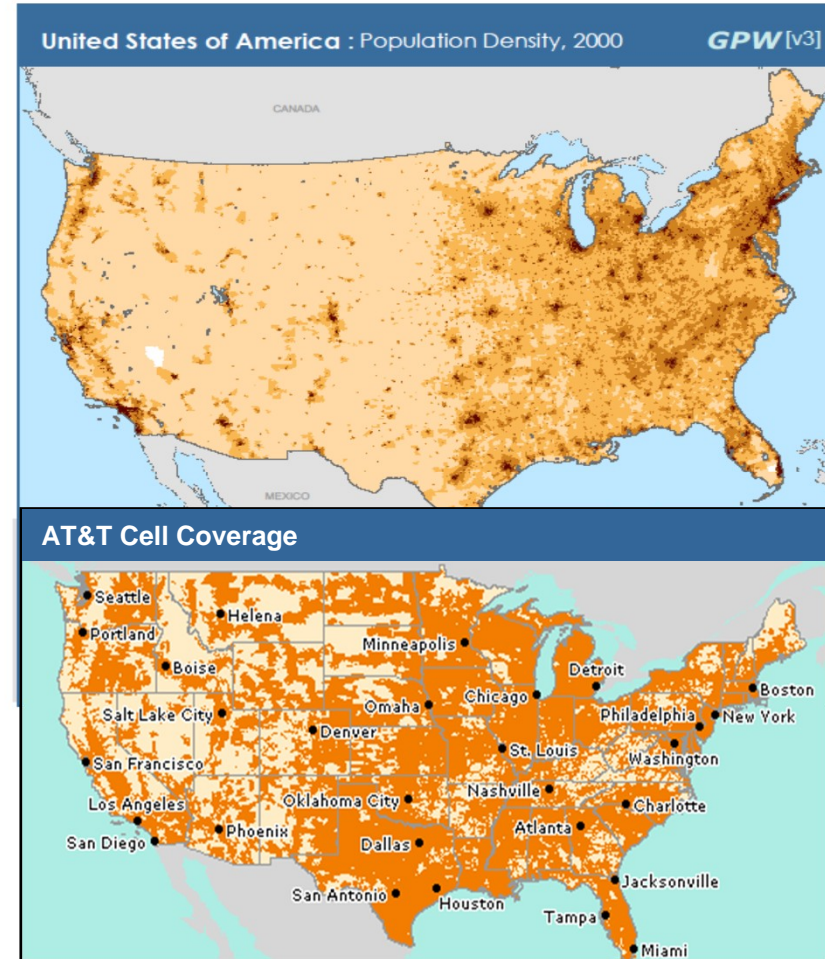


■ Cellular

- Opportunities in Maine, the mid-west and other rural pockets of the country

■ Wireless Broadband

- Reduces number of sites
- Speeds deployment
- Reduces capital requirements
- Reduces operational costs
- Increase customer base
- Improves performance



Economical Solution for Rural U.S. Coverage

CAPEX Savings



- A nominal 10X expansion of the coverage area relative to a traditional cell-site translates into 10X reduction in the number of sites required
 - Significant less number of base stations
 - Reduction in cables and RF equipment requirement
 - Exponential reduction in construction and deployment costs
- Considerable simplification and cost reduction in the backhaul network

OPEX Savings

- Reduction in network maintenance and repair costs by due to decreased number of required BTSs in the network
- Reduction in rental and lease expenses for land, towers, BTS premises and rented transmission lines
- Reduction in capital expenditure and extended useful life of equipment
- Energy utilization efficiency



- **Opens previously economically unviable territory for expansion**
- **Improves utility of the service by enabling continuous coverage (homes, fields and roads in between population centers)**
- **Faster deployments give competitive advantage in customer acquisition and revenue capture**
- **Increased tower capacity gives opportunity for increased revenues and improved profits**